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The Political Nexus between Water and Economics in Brazil: A Critique of Recent Policy Reforms

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Antonio A. R. Ioris,

Abstract: The reform of water policies in Brazil has involved a combination of regulatory norms and economic-incentive instruments. Nonetheless, contrary to its formal objectives, the process has largely failed to prevent widespread environmental impacts and growing spatial and sectoral conflicts. The main reason for such failures is the perverse influence of market rationality, which is particularly evident in the reorganisation of the public sector, the quantification of the monetary value of water and the payment for environmental services.

Keywords: water reforms, ecological economics, political ecology, IWRM, Brazil

JEL codes: Q25, Q28, Q, 56

1. Introduction: The reform agenda

Allocation and use of water are among the most pressing issues of the contemporary search for better standards of life, social justice and environmental conservation. To a large extent, this debate has evolved around the need to expand water infrastructure, as a requirement for economic growth, the removal of ecological degradation and enhancement of water services. If during most of the 20th Century large sums of public money were invested in water engineering, with time it became increasingly evident that traditional interventions were also responsible for water pollution and altered river flows, without necessarily satisfying essential public demands. The realisation of the shortcomings of conventional approaches to water infrastructure led, since the end of the 1970s, to a review of water policies and government priorities. Emerging environmental awareness and public mobilisation, particularly in the political north, also added pressure on national governments and multilateral agencies to gradually shift from single engineering initiatives to more comprehensive responses. Informed by concepts such as ‘sustainable development’ and ‘systemic thinking’, new ways of dealing with water problems started to shape the global water agenda. Public policies have been

particularly influenced by the goals of integrated water resources management (IWRM), which include the formulation of ‘holistic’ solutions to water management problems, the reconciliation of multiple demands and, crucially, the appreciation of the economic value of water (Mitchell, 2005).¹

Because of the more explicit recognition of the economic value of water, calls for economic efficiency and market exposure have occupied centre stage in the agenda of water reforms. It represents a move in favour of hybrid mechanisms of environmental governance and beyond the divisions between state-market-society that allegedly caused most of the mistakes in the previous decades (Lemos and Agrawal, 2006). It is now claimed that adequate solutions to old and new management problems should include not just the direct costs related to project implementation, but also the calculation of the monetary value of water in order to “eliminate inefficiencies and express its full economic potential” (WAAP, 2006). According to this position, “a major weakness of past approaches to the water sector has been the excessive reliance on overextended government agencies to manage water resources” while the new agenda calls for “greater reliance on pricing and incentives” (The World Bank, 1993: 47). Therefore, the application now of market-based solutions to environmental problems is expected to foster economic rationality and promote management efficiency. Interestingly, the international pressures for the adoption of market-inspired reforms have induced a homogenisation of water policies around the world, despite major social, cultural and economic differences between countries. For that reason, it is worth asking whether the ongoing reforms have actually resulted in any meaningful solutions to highly contingent and localised water problems. Considering the environmental and social statistics available in various UN reports and national assessments, it is evident that recent policies have largely failed to secure environmental restoration or implement more equitable basis of water allocation and use. Notwithstanding a change in the discourse, in the countries where the ‘new management paradigm’ (cf. Formiga-Johnsson et al., 2007) has been applied, the outcomes of the reforms have been restricted to some bureaucratic improvements and, at best, the removal of isolated, circumstantial problems.

The Brazilian experience is a case in point of the inherent limitations of the global water reforms and this essay intends to discuss the contradictory influences of neoclassical economics on the ongoing reorganization of water management in Brazil. It will be shown below that, with the approval of a new water law in 1997, an extensive regulatory apparatus was put in place, mostly influenced by the goals of integrated management, but so far it achieved only marginal results in terms of environmental

¹ Water management comprises multilayered measures carried out by public and private organisations in order to assess, allocate, use and preserve water stocks, aquatic processes and catchment systems. Water policy includes the set of guidelines, legal instruments and economic incentives used by public organisations to influence social institutions and personal decision-making. Both water management and water policies express political disputes and the balance of power between social groups, and between society and the State.

restoration and conflict resolution. Although the legislation delegated to catchment committees the approval of plans and the reconciliation of spatial differences, the core element of new policies has been the expression of the monetary value of water. It will be suggested that, despite the rhetoric of environmental sustainability, official initiatives continue to subject socionatural water systems to economic exploitation and unfair distribution of opportunities. The recent approval hydropower projects by the national administration, in spite of strong public opposition, evidences the priority of 'economic growth at any price'. In the same way, newly formed decision-making forums have been dominated by the same rural oligarchs that traditionally controlled economic and social opportunities related to water use and conservation (Valêncio e Martins, 2004). It means that, instead of promoting a genuine change in public policies, the new approaches have largely preserved the hegemonic interests of landowners, industrialists, construction companies and real estate investors, at the expense of the majority of the population and ecological recovery. This text will eventually contend that effective responses to water problems require new basis for the use and conservation of water, which should be necessarily constructed according to social justice and environmental sustainability requirements, but also free from the pervasive influences of market rationality.

2. Water and economics: The missing political link

Water management has always been one of the preferred themes of the economic theory applied to the environment, which includes, for example, the scarcity of water stocks and the social cost of pollution. Because of its permanent circulation, water poses a peculiar challenge to economists given that more than one person can appropriate the same unit of water from a common river or aquifer. Another methodological difficulty is the fact that water availability is normally concentrated in certain areas or during certain periods of time, while water usage varies according to socioeconomic demands, personal preferences and cultural values. Because of such particular properties, the economic literature on the use and conservation of water is voluminous and grows rapidly. Already in the 18th Century, the founders of the discipline discussed the potential scarcity of natural resources in relation to a growing human population. For the *resource economists* of that period, nature contained a large reserve of raw materials freely available for human exploitation; water was seen as abundant and, consequently, there was minimal need to limit its use (e.g. Adam Smith considered water beyond economic value, described as a 'free good' and, for that reason, different from landed property). A few decades later, David Ricardo pointed out that only if water could be appropriated and existed in 'moderate abundance' it would then afford a rent similar to land (Ricardo, 1962 [1817]). Later in the 19th

Century, the Marxist thought provided an early critique of the worsening of environmental conditions under capitalist production (Burkett and Foster, 2006), but it was the work of neoclassical economists that then achieved resonance with policy makers. For instance, J.S. Mill recommended that governments should define property rights over natural resources - including property over water and forests - to secure their proper use as an “inheritance of the human race” (Mill, 1965 [1871]). The ideas of Marshall (1966 [1890]) about public amenities and his marginal theory of value inspired Pigou (1938 [1920]) to describe environmental problems as a divergence between ‘marginal social net product’ and ‘marginal private net product’. According to the marginalist theory, those that benefit from the use of the environment should internalise the social costs (externalities) of their activities via, for example, the payment of fees and taxes. A little later, Coase (1960) submitted that government intervention was less important for the adequate use of resources, since the bargaining between players constituted a more effective solution. In that case, as long as a regime of explicit ownership can be established, water allocation and pollution problems are solved rationally, as long as water can be bought and sold through the market (Ditwilier, 1975).

The debate between the ‘welfare theory’ (after Pigou) and the ‘free market theory’ (after Coase) resulted in the establishment of *environmental economics*, a subdivision of microeconomics applied to the use and conservation of natural resources. The underlying principle behind environmental economics was the maintenance, via economic instruments, of sufficient habitat features and the observation of the ‘safe minimum standard of conservation’ (Ciriacy-Wantrup, 1952). For example, economists can develop mathematical approaches to determine potential economic benefits and relate it with the acceptable level of impacts caused by a new hydroelectric dam (Bishop, 1978). The key tenet of environmental economics is the recognition of resource scarcity and, thus, the increasing marginal utility of water. Because water is seen as a scarce resource, the monetary quantification of its value becomes a prerequisite for efficiency and sustainability (Rogers et al., 2002). Monetary valuation, which has been widely used in decisions about project priorities and mitigation measures, is normally estimated in relation to parameters such as household income, real state figures and personal preferences (Van Houtven et al., 2007). Based on monetary valuation, environmental economics nowadays includes methodologies such as supply-demand management, marginal cost pricing, valuation of water in alternative uses, and optimisation models (Ward, 2007).

Environmental economists claim that valuation techniques can inform the choice among numerous potential methods of improving the quantity and the reliability of water supply (Castle, 1999). However, in practice, the assessments informed by environmental economics have fallen short of resolving mounting impacts associated with water supply, irrigation and hydroelectricity projects.

When things go astray, environmental economists normally blame administrative inefficiencies or lack of enough data to support decision-making, instead of questioning the political and structural causes of project mistakes. Piecemeal solutions are emblematically demonstrated by the use of mathematical models to calculate the market price of water, while ignoring the causes of scarcity and who really benefits from water use (e.g. He et al., 2007). The reduction of socioeconomic and environmental processes to independent utility functions by environmental economists became a main source of criticism. In the 1960s, *neoinstitutional environmental economics* started to pay particular attention to processes of institutional change and transaction costs (i.e. costs incurred in dealing with human interaction). For this group of scholars, economic choices are related to a complex array of social functions and structures (termed ‘institutions’) ranging from court decisions, informal rules and personal beliefs (Swaney, 1987; see also Hodgson, 2006). It is the institutional structure of entitlements (property or liabilities) that influences the nature of the bargaining process between two or more parties, instead of the exogenous preferences and costless social contracting of neoclassical economics. For example, riparian institutions consolidated over time normally determine the use of water from rivers by some people, while prevent the access of others, independently from the direct economic outcome of water use. Neoinstitutional economists maintain that the analysis of environmental problems should be based on interdependence rather than on externalities (cf. Paavola, 2007). From an institutional perspective, instead of focusing on the efficient use of resources, the solution to environmental problems requires the determination of collective standards of performance that can reward individual initiative, experimentation and efficiency (Bromley, 1991).

In the end of the 1980s, a group of academics proposed a related line of investigation under the name of *ecological economics*. The main goal for ecological economists is to encompass production and consumption in the broader sense, moving away from the neoclassical focus on the optimal allocation of resources (Dale and Farley, 2004). Ecological economics has attempted to replace the rigid mindset of environmental economics with a more plural and heuristic perspective (Gowdy and Erickson, 2005). However, there remains yet a fundamental tension at the heart of ecological economics: on the one hand, it is committed to a conceptual pluralism; on the other hand, ecological economics is still heavily influenced by the narrow market model of thinking (Burkett, 2003).² The persistent reliance on market-based solutions to environmental degradation has been a systematic shortcoming of many ecological economists and betrays their frequent association with the

² Since the outset, ecological economics accommodated a variety of ideological and methodological approaches (it is essentially a ‘transdisciplinary’ field of study, cf. Söderbaum, 2000), embracing ideas from neoclassical environmental economics to ecological studies and political economy (Spash, 1999).

mainstream ideas of environmental economics. By the same token, conventional neoinstitutionalists also succumbed to the magnetism of environmental economics and direct their attention to the removal of institutional barriers for the ‘proper’ operation of the market forces (e.g. Saleth and Dinar, 2005).

The fundamental problem with mainstream economists – including not just environmental, but also many ecological and neoinstitutional authors – is the failure to identify the contradiction between the expansion of the market rationale and the achievement of sustainable and equitable solutions to water problems. Notwithstanding the persuasive discourse on the aptness of financial incentives and economics instruments of water management, such approaches provide only a narrow and transitory answer to environmental degradation, at the same time that embolden capital accumulation at the expense of social inequalities. These economists fail to accept that market-based policies (which include both market transactions and governmental interventions that organise the market), instead of removing environmental pressures, immediately transform nature conservation into an object of capital accumulation. If the exploitation of natural resources by market forces had historically been responsible for the commodification of nature, ‘ecological modernisation’ has attempted to use the same market rationality to prevent or remedy environmental degradation. However, as described by Smith (2007), ‘green capitalism’ has ultimately produced new markets in ecological goods (for example, pollution emissions trading and markets of ecological services), which comprise commodities that are simultaneously excavated (in exchange-value terms) from pre-existing socionatural relations and, as part of their production, are reinserted or remain embedded in socialised nature. The ‘greening’ of capitalism did not change the fact that environmental degradation continues to derive from the inherent characteristics of the capitalist mode of production, such as private property, competition, the goal of producing exchange values instead of use-values, the recurrent crisis, and the specific shaping-utilisation of technology with an end to extracting and appropriating a maximum surplus value (Liodakis, 2000).

For mainstream economists issues of power asymmetry and class, gender and race discrimination have either remained out of the debate or contained in a secondary agenda of social compensation (epitomised by the World Water Week that takes place in Sweden every year). Because of the focus on isolated elements of water systems, the prevailing school of water economics has largely ignored power inequalities behind decision-making structures (e.g. Heinz et al., 2007) and remains silent to the fact that water management problems are profoundly influenced by cultural circumstances and political disputes. There is, thus, little consideration of social inequalities associated to the use and conservation of water, which directly depend on the biophysical materiality of the nature that is incorporated into capital accumulation (Sneddon, 2007), as well as on the cultural context where water

is used for the production and exchange of commodities (Page, 2005). The realisation that the economy cannot be dissociated from natural and social survivability, nor from ethics and justice, opens a new arena for academics to engage with water management problems. The social and environmental challenges of the globalised economy require, according to Martinez-Alier (2002), a close cooperation between critical ecological economics and political ecology. Leff (1996: 146) argues that we need a “political economy of the environment” that understands poverty, unemployment and the destruction of natural resources as effects of given relations of production. Rather than the political neutrality advocated by mainstream economists, the starting point of the economic analysis is the fact that the use and appropriation of water describes a fundamental connection between flows of water, flows of commodities and flows of power (Swyngedouw, 2004). The task at hand is to creatively combine a critique of the prevailing economic paradigm with the formulation of alternative models of social organisation and economic production, something that Agyeman and Evans (2004) have called ‘just sustainability’. In particular, critical economists cannot be unaware to the uneven balances of power that preclude certain social groups from having enough water or being protected from environmental degradation. It is not too late to remember that “unless analyses of development begin not with the symptoms, environmental or economic instability, but with the cause, social injustice, then no development can be sustainable” (Middleton and O’Keefe, 2001:16). The above (schematic) overview of the connections between the economic science and water management will facilitate the analysis of the contradictions associated to the implementation of new water legislation in Brazil.

3. The economic spectre of the water reforms in Brazil

In the 20th Century, some of the largest water projects in the world were built in Brazil to generate electricity, regulate river flow and assist irrigation and urban growth. “Exploiting perceived abundance for economic development has been the dominant historical premise of Brazilian policy toward water and rivers” (Conca, 2006: 311). The construction of dams and the expansion of water infrastructure were part of a national programme of industrialisation and economic development that lasted between 1930s-70s (Ioris, 2007). During this period, there was timid enforcement of the environmental legislation, demonstrated by the fact that contentions issues were only superficially considered at the very end of the planning application process (Salvador, 1999). Weak environmental regulation was also used as a deliberate policy to attract foreign investments, particularly directed to intensive and highly polluting industries (May, 1999). The official response to the social and environmental impacts of water projects started to be articulated in the 1980s, when a group of avant-garde civil servants and

academics pressed for reforms and for the adoption of the IWRM principles (Conca, 2006). This reaction ‘from within’ was initially stronger in the state of São Paulo, but before too long it passed to influence the debate on water reforms in other parts of the country. The discussion eventually reached the National Congress and culminated in the approval, in 1997, of a new legislation on water policy (Law 9,433) that replaced the previous Water Code of 1934. Since then, an extensive structure of policy-making and water regulation has been implemented in the federal and provincial (state) levels of government. According to the provisions of the 1997 legislation (Article 12), in order to extract water or discharge effluents the operator had to first apply for a water user licence.³ More than 140 catchment committees were established in the recent years and these are the official stakeholder representation forum, whose main responsibility is to approve the catchment management plan (where environmental and socioeconomic objectives are set out).

Notwithstanding the number of events and campaigns, a more careful examination of the first ten years of the new legal framework reveals disappointing results in terms of reducing impacts and improving the management of water systems. Such gloomy picture is formally acknowledged by the Ministry of the Environment (MMA, 2006), in particular the widespread sources of pollution in urban areas (e.g. only 47% of the municipalities have sewerage systems and only 18% of the total sewage is treated) and in the countryside (e.g. around 70% percent of the watercourses between Rio Grande do Sul and Bahia are polluted by agro-chemicals used in intensive crop production). In addition, resource availability has been compromised by the over-extraction of water and the continuous construction of large dams. The failures of the new water policies suggest that the theory of integrated water management has been mechanically pushed through by multilateral agencies to grant functions to a system yet to be constructed (Abers and Keck, 2006). Most authors, nonetheless, continue to praise the quality of the water legislation on the grounds that there has not been enough time yet for the full expression of the ‘sophisticated’ principles ingrained in the law (Machado, 2006) and, despite remaining problems, the ‘governance’ of water has come to be increasingly institutionalised in Brazil (Conca, 2006).

However, the overall trends of water degradation and, more importantly, the selective involvement of the public in the decision-making seem to suggest a more fundamental weakness on the ongoing water reforms. Decisions about water use and conservation in Brazil remain intrinsically linked to systems of political and economic control long established in colonial times (Bryant, 1998) and

³ No licence is required for rates below a certain threshold (normally 20 m³/day); most licences for effluent discharge have no specific conditions in terms of chemical concentration (the exception being licences issued to water sanitation companies).

associated to the old patrimonialistic operation of the Brazilian state.⁴ In effect, the legal reforms have privileged the influence of private agents in the formulation of water projects (e.g. hydropower schemes and public water companies), at the same time that raised novel opportunities for capital accumulation via, now, the adoption of ecological conservation measures. It is certainly not a coincidence that the introduction of new water management happened together with the wider liberalisation of the Brazilian economy, which has consisted of declining public investments, high interest rates, labour market reforms, high unemployment and attraction of foreign capital (cf. Mollo and Saad-Filho, 2006). In this case, the water sector reproduces the same contradictions and conflicts of other public areas subjected to the influence of the neoliberal agenda of development. Despite this pervasive influence of neoclassical economics on the ongoing water institutional reforms in Brazil, there has been an insufficient analysis of the expanding economic rationality underpinning the assessment of environmental impacts and selection of conservation measures. It means that the association between the new approaches to water problems and the hegemonic influence of market-based policies remains largely ignored and undertheorised. As a contribution to the debate, this text organises the economic pressures under three separate headings, namely the ‘modernisation’ of the public sector, monetary valuation of water and payment for ecosystem services. It should be noted that, in practice, these are closely interrelated processes that constantly reinforce each other.

3.1 Public sector ‘modernisation’

The redesign of the Brazilian public sector started in 1995 with the publication of the ‘White Paper on The Reform of the State Apparatus’, which included a new set of criteria for investing in infrastructure and the management of public utilities (MARE, 1995). The justification was, on the one hand, the lack of public funds to modernise and expand public services and, on the other, the supposedly ineffective and wasteful operation of state-owned enterprises. The overall reorganisation of the public sector had also important repercussions for water regulation. Within the structure of the Ministry of the Environment, a new water secretariat was created in 1995 to coordinate national policies and influence the legal reforms under debate in the parliament. With the approval of the new legislation in 1997, the National Water Resources Management System (SINGREH) was established to bring together various public agencies and consultative committees. The structure was completed in 2001 when the National Water Authority (ANA) was installed to be responsible for water use permits

⁴ Patrimonialism, in the Weberian sense, has been a fundamental characteristic of the public sector in Brazil, a phenomenon with roots in organisation of the old Portuguese State (Faoro, 2001).

and the implementation of technical programmes. Notwithstanding the consolidation of a professional bureaucracy to deal with environmental policies in Brazil, still only a small fraction of the public budget has been spent on environmental issues (around 0.4%), most of it used on administrative rather than on core functions (Young, 2005).

A more substantial limitation of the regulatory structure is the systematic concession to economic growth priorities. From local to national initiatives, the passive acceptance of the idea of economic development 'at any cost' has remained a strong feature of the decision-making process (for instance, new techniques developed for the assessment of water projects maintain that the design of new hydropower schemes should include the environment as merely a 'variable in the equation', e.g. Tolmasquim et al., 2001). The recent years have shown politicians always too keen to force the authorisation of new public or private initiatives on the grounds of raising taxes and job creation, even when the actual results are evident and widespread social and ecological disruption. In 2005, the Ministry of the Environment was forced to approve a questionable project of water transference from the São Francisco River to northern catchments in the semi-arid region. This inter-basin project has been vehemently criticised on the grounds that the benefits of water transference are likely to be appropriated by political leaders at the expense of socionatural impacts on both the source and the receiving catchments. Likewise, in 2007 the Ministry was compelled to grant licences for the construction of two large hydropower schemes along the Madeira River, in the heart of the Amazon region, regardless of the direct disapproval by its senior staff and technical experts. In other regions of Brazil, hydraulic projects continue to be approved and implemented even if they violate traditional community rights over common resources (Ribeiro et al., 2005).

Another significant element of the conservative 'modernisation' of the public sector is the programme of public utility privatisation, which is among the largest in the world. The privatisation of electricity and basic sanitation companies represented around a quarter of that total assets transferred into private hands (approximately US\$100 billion were transferred into private hands, either through the full divestiture or through operational concessions of public utilities).⁵ Because 90% of the electricity generated in Brazil comes from hydropower schemes, the privatisation of energy has in effect been an indirect form of water resources privatisation. So far, most of the electricity distribution companies and around 40% of the generation companies owned by the state were sold-off to private operators. In nominal terms, the transfer of electricity companies to private hands attracted US\$ 23.5 billion (Anuatti-Neto *et al.*, 2003). Around 48% of the payments made by private investors to acquire

⁵ Public irrigation schemes have also been increasingly transferred to private enterprise, normally through a fixed term concession of land and infrastructure.

electricity companies were financed by government-owned banks (particularly via the national development bank BNDES). The involvement of private operators was also facilitated by changes in the legislation that removed the difference between domestic and foreign firms. Privatisation was further encouraged by reducing investments in public utilities prior to the sell-off (i.e. to reduce political opposition due to the deteriorating performance of state-owned utilities), contractual clauses that protected privatised companies against changes in the exchange rate, electricity tariffs rising above inflation and the removal of compensatory subsidies to low income families (Pistonesi, 2005, quoted in Solanes and Jouravlev, 2006). Since 2003, the current federal administration has reduced the emphasis on the full divestiture of public electric utilities, but has maintained other traditional options of private sector involvement by contracting out services and public-private partnerships (see below).

Different that the hydroelectric sector, the privatisation of water supply and sanitation has been more restricted and faced higher political resistance. One fundamental obstacle is the hybrid responsibility that characterises water services in Brazil: according to the constitution, municipal authorities are in charge of water services, whereas the great majority delegated the operation to companies owned by the state (provincial) governments. The agreements between municipal and state authorities were formalised in the 1970s, during the military dictatorship, when the national policy was to concentrate resources and power in the state utilities. Under the influence of the liberal policies of the 1990s, some state administrations dissolved or demobilised their water companies, unilaterally returning the responsibility to the municipal administrators. That gave the opportunity to some municipal administrators to transfer the local water services to private companies (mostly foreigners). Privatisation was further encouraged by the reduction of investments by the central government, which is responsible for managing the main investment fund (i.e. FGTS): between 1995 and 1998, only R\$ 1.8 billion was invested in the sector, while R\$ 7.4 billion of past loans were paid back to the central government.⁶ It means that a surplus of R\$ 5.7 billion was retained in the investment fund, regardless of the urgency of social demands (Oliveira Filho, 2006). During this period, a specific agreement was signed with the IMF committing the Brazilian government in 1999 to broaden the scope of the privatization of water services. The result is that the annual average public investments between 1995 and 1998 totalised R\$ 680 million, but the same average reached only R\$ 68 million between 1999 and 2002 (it was zero in 2001). In parallel, while the central government reduced the access of public utilities to governmental funds, incentives and loans were made available to attract the attention of private operators (Oliveira Filho, 2006). Nonetheless, because of lengthy negotiations and legal

⁶ 1.00 US\$ is approximately R\$ 2.00.

disputes, only 3% of the water supply and sanitation utilities were privatised, which serve around 5% of the national population (Britto and Silva, 2006).

The privatisation of water supply and sanitation is only one element of a very complicated sector that still fails to serve 24.2% of the population with drinking water and 46.2% with sewerage services (cf. IBGE, 2004). Profound injustices have been inflicted upon marginalised social groups who, especially in the larger cities, have been forced to live in floodplain areas prone to flooding and lacking the most basic water infrastructure. In many cases, such as in the metropolitan area of Rio de Janeiro, poor households only have access to precarious water service and need to complement that with the purchase of costly water from private vendors.⁷ If in the previous decades water supply and sanitation was restricted to the wealthier cities and neighbourhoods, the recent privatisation of publicly owned companies little improved the situation. Instead of higher investments and efficiency, privatised companies have been criticised for charging more for a worse, less reliable service. In many situations, privatisation has shifted “the burden for providing services to the poor from society as a whole and back to the poor themselves” (Mulreany et al., 2006). Privatisation has also raised a range of conflicts between private operators, public regulators and customers, as well as evidences of wrongdoings (Mello, 2001).⁸ The concession process has been far from transparent, despite steady increase of tariffs and charges (for instance, the charge to connect to the water network system in the city of Limeira increased from 65% to 176% of the official minimal month salary after privatisation, with no discounts for low income families, cf. Vargas, 2005).

Similarly to what happens in other countries, privatisation in Brazil faces growing scepticism about the actual motivations of companies that are more accountable to the shareholders than to their customers and, at this point in time, the future of the water sector is uncertain, with an unclear legislation and ambivalent policies. The reaction against utility privatisation has been mixed and sometimes hesitant. On the one hand grassroots organisations have worked together with the National Association of Municipal Water and Sanitation Utilities (ASSEMAE)⁹ to demonstrate the importance of maintaining both the ownership and the operation of water companies in the hands of the state. This movement against privatisation has underscored good examples of publicly managed services, such as

⁷ Interestingly, in a fieldwork research in the low-income municipalities of the Baixada Fluminense (to the north of Rio de Janeiro, which was carried out between June and August 2008) we detected that the majority of poor residents are clearly not against paying for water (despite the fact that the minimum tariff, around US\$ 20/month, can represent a significant burden on some families). On the contrary, and these low-income groups are quite willing to accept the payment of charges, provided that the service effectively improves.

⁸ In 2001, a political activist was murdered in the state of Mato Grosso after having denounced corruption in the privatisation of the municipal water utility (reported by Hall and Lobina, 2006).

⁹ ASSEMAE represents more than 2,000 Brazilian municipalities that have a direct administration of their water services. The remaining municipalities (approximately another 3,650) have delegated the water service to state water companies or private operators.

in Porto Alegre, where the combination of an autonomous public mobilisation and a competent left-wing administration (Heller, 2001) achieved an enduring transformation of the services provided by DMAE, the municipal water utility (Holland, 2005). On the other hand, while a new legislation on basic sanitation was passed in the year 2007 (Law 11,445) and emphasises the provision of services as a basic human right, it also stimulates the formation of ‘public-private partnerships’ as an important strategy for improving and expanding water services (Alves, 2008), but these partnerships have been tacitly used in Brazil and in other countries as a disguised form of utility privatisation. There are also signs that increasing the participation of the private sector in the provision of water services (not necessarily though privatisation, but via other business arrangements) has attracted growing sympathy even from ASSEMAE members and left-of-the-centre politicians (Castro, 2008). Similarly, the alternative to ‘public-private partnerships’ often mentioned by activists is the formation of ‘public-utility partnerships’ (or public-public partnerships), but sometimes these are promoted in the wake of failed private-sector contracts and the result is the cherry-pick of the most profitable areas and the neglect of less profitable communities (Hall and Lobina, 2007).

3.2 Environmental charges and the monetary value of water

The very first article of the 1997 water law established the primacy of the neoclassical economic theory over water management in Brazil. The article recognises that: “(...) water is a scarce natural resource, which has economic value”. There is here an unambiguous resemblance with the fourth UN Dublin Principle (approved at the 1992 International Conference on Water and the Environment) which established that “water has an economic value in all its competing uses and should be recognized as an economic good”. This phrase encapsulates the two fundamental tenets of the neoclassical paradigm of environmental management: the idea of a scarce resource and the (economic) value of water. In effect, the expression of the economic value of water has been the main concept supporting the formulation of subsequent policies and initiatives in the last decade in Brazil. As repeatedly mentioned in the official publications, because of quantitative scarcity and declining quality, water is no longer a ‘free good’, but has clear economic value. In other words, because water is (or was made) scarce, it now requires an economic treatment to address existing and future problems. Once the monetary value of water is determined (what requires the application of neoclassical methods of environmental economic, cf. Serôa da Motta, 1998), it can be managed as any other economic factor of production that has marketable costs, effects and benefits. The ideological

affirmation of its scarcity transforms water into an economic factor and a profitable commodity rather than a human right with vital ecosystem functions (Swyngedouw, 2005).

The most relevant expression of the monetised value of water in Brazil has been the imposition of water user charges (i.e. 'water pricing') under the 'user-pays principle' or the related 'polluter-pays principle'. According to mainstream economic approaches mentioned above, those wanting to extract surface and ground water or dilute effluents in the watercourses should pay a charge proportionate to the negative impacts caused (i.e. the so-called environmental externalities).¹⁰ In theoretical terms, the introduction of water user charges in Brazil has aimed to minimise social costs through the determination of the optimum scale of operation and induce rational economic behaviour, but also to generate revenues for environmental restoration and law enforcement (Garrido, 2004). However, since the early days of the new legal regime in the end of the 1990s, the imposition of water charges has grown into controversy on the national and local scales. In many catchments, the political maelstrom related to the controversial introduction of water charges has hijacked the broader debate on environmental restoration and prevention of impacts. The perverse consequence of water user charges is evident in the areas where it has already been adopted, in particular the split of stakeholders into confrontational groups and the widespread suspicion about hidden sector agendas. The new water policies, including the introduction of water pricing, need to be understood in the broader context of national and regional development influenced by neoliberal demands. That assurance is particularly important to agroindustrial companies that move their activities to water scarce areas (examples of that are industrial parks and irrigation projects being constructed in north-eastern states, Bahia, Ceará and Pernambuco in particular, and agribusiness complexes in the states of Goiás and Mato Grosso). It is not without reason that the official policies support the introduction of water charges only in catchments where water conflicts exist or are likely to emerge (cf. GEO Brasil, 2007: 54). Because the companies are attracted to the areas of economic frontier due to the availability of natural resources, cheaper labour force and fiscal incentives, the payment for water user charges is a matter of only secondary importance. Rather than a simple fee, paying for bulk water use represents an additional guarantee that the conditions of production (water availability in this case) will be provided and maintained by the state. However, the combination of water and development policies ends up causing a twofold penalty to traditional water users, given that these are usually less well prepared to cope with

¹⁰ For example, in the Paraíba do Sul the charging methodology demands that all water uses above a certain threshold (i.e. consumptive uses above 1 litre/second and hydropower bigger than 1 MW) must pay a monthly charge, calculated taking into account three factors: the extraction rate, the percentage of use and the quality of the effluent. There is a standard charge (R\$ 0.02/m³) for industries, water supply and mining, and significant discounts are offered for agriculture and aquaculture in this particular river basin.

the new water charges and, more importantly, their activities may be seen as second-rate when compared with the newcomer water users.

Instead of improving the environmental condition of catchments and places, the payment for water charges tend to be tacitly used to validate the operation of environmental impacting activities: the payment for water use by industries, electricity operators and irrigators is utilised as a political justification for avoiding close scrutiny. That has been the case with industrial effluent discharges in the Paraíba do Sul catchment, where the industrial sector has been able to preemptively manipulate the approval of water charges so suit their demands for soft regulation. At the same time, larger industries have opportunistically used their payment for water use to improve their commercial image as corporately responsible (Féres et al., 2005). Since industries are now officially involved in the system of environmental regulation, there is scarce room for calling into question their responsibility for the poor environmental quality of the catchment. In spite of the ‘inclusive negotiation’ that, according to Formiga-Johnsson et al. (2007), characterises the local experience, there is also an official acknowledgement that the implementation of water charges in the Paraíba do Sul catchment has not progresses as expected in part because of the absence of participatory consultations with the various stakeholder sectors (UNEP, 2004). The result is that the introduction of bulk water charges has contributed little in terms of environmental restoration in the Paraíba do Sul: the official statistics show that, between 2003 and 2006, the charging scheme was responsible for collecting a total of R\$ 25.4 million, which is considerably less than the estimated need to restore the catchment (i.e. an annual investment of R\$ 360 million or R\$ 4,600 million by 2025, cf. Coppetec, 2006).

3.3 Payment for environmental services

Apart from the ‘modernisation’ of the public sector and monetary valuation, the market-based solutions that underpin the ongoing institutional reforms have increasingly facilitated the adoption of other indirect mechanisms of water commodification. One of these new forms of converting nature into tradable commodities is the payment for environmental services (PES), which includes ‘services’ related to watershed conservation such as the maintenance of clean water supply and protection against soil erosion (Kosoy et al. 2007). The rationality of PES is directly inspired in the neoclassical concepts that free market operations can guarantee the most efficient solution to environmental externalities. The justification is that those who benefit from ecosystem services should be prepared to make direct payments to the local people more closely associated to the conservation of the ecosystem. For instance, if the protection of an upstream forested area helps to maintain river flows, the

environmental service (in this case, the guarantee of water availability by the protection of the forest) should be paid by downstream water users. PES entails a full interchangeability between the market inputs used by the industries and agriculture and the non-market service of maintaining the river flow. The first requirement before PES can be adopted is obviously the calculation of the monetary value of the environmental services. The calculation is normally processed through ecosystem valuation methods, which normally produce significant inconsistencies. For example, Fearnside (1997) estimated that 10% of the Brazilian agriculture depends on rainfall originated from the evapotranspiration in the Amazon, which would correspond to an environmental service (i.e. guarantee of rainfall) that is worth US\$ 7 billions per year for the entire rainforest. On their part, Seidl and Moraes (2000) calculated that water supply and regulation in a single watershed in the Brazilian Pantanal amounts to US\$ 6.3 billions per year.

Regardless of those methodological difficulties, many Brazilian academics and policy makers have embraced the payment for environmental services as an ingenious option for dealing with water management problems. The National Water Authority (ANA) launched the “Water Producer Programme”, an initiative that offers financial compensation for soil conservation interventions that potentially increase or maintain water availability. One of the catchments covered by the programme, located in the municipality of Extrema, contains the freshwater supply to the city of São Paulo and, in 2007, landowners started to receive financial support to adopt soil conservation measures that indirectly protect watercourses. Another similar initiative is the Catchment Pollution Removal Programme (PRODES), which ‘buys’ the treatment of sewage by private or public operators (instead of the direct financing of the sewage works). The attractiveness of PES is demonstrated by two ‘private member’s bills’ recently introduced and currently under discussion in the National Congress (bill 142/2007 in the Senate and 792/2007 in the House of Representatives). Similar propositions were presented in various state assemblies to further regulate the payment for ecosystem services in areas under local jurisdiction (e.g. in the state of Acre). For many academics and politicians, the win-win promise of PES seems the ultimately proof of the perfection of the market, which is capable of finding inventive solutions to the very problems it causes. In view of that, PES would not only introduce a ‘sophisticated’ response to environmental degradation, but also generates new commercial opportunities related, for example, to the certification and monitoring of environmental services.

On paper, the certification of environmental services has the ability to promote environmental protection, since water users would become more aware of the economic value of ecosystems (cf. Silvano et al., 2005). In practice, however, the success of PES in terms of protecting and restoring the environment has been close to nothing. The disappointing outcomes of the PES experience can be

explained by various operational and conceptual frauds. First of all, it is extremely difficult to relate the provider of the service with those willing to pay for it. It has been reported the limitations of PES in watershed conservation in India due to high transaction costs and the intensification of poverty problems (Kerr et al., 2007). The adoption of PES has been also prevented by demand-side limitations and a lack of supply-side know-how (Wunder, 2007). Secondly, PES only works in situations where the threat of environmental degradation is extremely high. That is because it requires an irrefutable proof of the environmental risk to persuade beneficiaries to accept the payment for the service. If the PES regime becomes more widely adopted, it can even induce the artificial ‘fabrication’ of environmental threats in order to justify the payment. In other words, the implementation PES can divert the attention away from environmental protection towards profitable market transactions. Thirdly, in the few cases where it has been adopted, the price of the environmental service payment is not the outcome of free market bargain, but on the contrary it is created by the regulatory demands and opportunistic behaviour of private firms (Robertson, 2007). Fourthly and more important, the market logic behind PES is fundamentally based on a utilitarian relation between people and nature that ignores the capacity of local populations to appreciate the value and spontaneously protect their ecological base. This rationale assumes that human beings are naturally inclined to convert the natural resource into cash and, therefore, people need to be paid to avoid causing environmental harm (this is, for example, the argument of Vosti et al., 2003 for the protection of the Amazon Basin). It overlooks the fact that local populations have a long-term history of skilful interaction with the environment and that the pressures over natural resources are, to a large extent, created by economic globalisation, the same globalisation that now encourages the adoption of artificial schemes like PES.

4. The reform gridlock

The reform of water policies has occupied a central stage in the environmental agenda of Brazil in the last decade. The new water regulatory regime supposedly contains ‘advanced’ tools of environmental governance, including utility privatisation, water user charges and the payment for ecosystem services. Nonetheless, the environmental results of the new water regulation have been, at best, disappointing. The new regime has similarly aggravated stakeholder conflicts while it legitimises the negative impacts of more intensive water users (legitimised via operation licences and bulk water charges). It means that, in practice, little has changed: the stability of water systems and the fundamental rights of deprived social groups continues to be forfeited under the need for more dams or the exploitation of catchment resources. Even in catchments with meaningful public mobilisation and

solid structures of public representation, the degrading trends remain unaffected (paradigmatic examples are the river basins of Sinop, São Francisco, Piracicaba and Paraíba do Sul, among others). This apparent paradox of novel legal approaches that reproduce old water problems can only be explained by the bureaucratisation of the relations between society and nature under hegemonic market-based policies (i.e. the dynamics of power and rationalisation described by Foucault). The persistence of water management problems is certainly acknowledged by many scholars (e.g. Abers and Keck, 2006; Conca, 2006; Machado, 2006), however there is still limited scrutiny of the systematic failures of the new water regulatory regime. It is rare to see authors willing to investigate why technological improvements, public participation and mitigation measures have been systematically sidestepped by the accumulation strategies of contemporary capitalism.

As in other countries undertaking similar institutional reforms, a brief search in the academic bibliography and policy documents reveals the powerful economic ‘mantra’ that underpins the ideas about the ongoing water reforms in Brazil. An intriguing example is provided by the recent National Water Plan, which explicitly claims that economic growth is a precondition for the solution of water-related problems. The plan describes three future scenarios for water sector, which are described as ‘water for all’, ‘water for some’ and ‘water for few’. The main difference between those scenarios is the projected annual rate of GDP growth, respectively 4.5%, 3.5% and 1.5% per year (MMA, 2006). According to these scenarios, water access would be universalised in Brazil only with a higher rate of economic growth, at the same time that environmental restoration depends on the good performance of the economy. Here, as in other documents, the association between water management and economic growth ultimately instils a particular pattern of social relations that are fraught with tensions and contradictions. If in the past, the emphasis was on the construction of engineering works, the current water management reforms aim to remove obstacles to economic production (e.g. river pollution and water scarcity), at the same time that raise new alternatives for capital accumulation (e.g. environmental consultancy and the payment for ecosystem services). The same way that economic agents need to invest in technology to increase relative surplus value and also contain the workforce, there is a need to remove ecological degradation in order to restore accumulation conditions and contain the threats to the stability of economic systems. As pointed out by Smith (2007), surplus value is extracted from the dead labour dormant in the degraded watercourse via the ‘excavation’ of the relations between nature and society under capitalism. Crucially, before those accumulation responses can be adopted, it is essential that the monetary value of water be quantified and discursively normalised, which is achieved by the imposition of water charges (i.e. the sophisticated approaches developed by mainstream economists to estimate water charges have, as a direct consequence, the

institutionalisation of a common monetary basis among water users).¹¹ The powerful symbolism of the monetary value of water makes possible the reinsertion of degraded environmental systems into production relations via the commodification of restoration and conservation measures.

There are common similarities between the exacerbated influence of mainstream economics over the reform of the water sector in Brazil and experiences of the majority of Latin American countries (see Solanes and Jouravlev, 2006). New forms of dealing with water management started to be implemented in the region after the end of the military dictatorships in the 1980s, when the approval of liberalising laws to regulate environmental conservation and utility operation coincided with a whole range of market-friendly measures. That included the closure of government departments, the privatisation of government-owned assets and the aggressive attraction of foreign investors. The commonalities between the Brazilian experience and what happens elsewhere in Latin America is not simply a coincidence, but attest the exogenous origins of the ongoing water reforms. In the same way that development banks and multilateral organisations encouraged the expansion of water infrastructure after the Second World War, the current water reforms are fundamentally grounded on concepts that emanate from universities and think-tankers based in the North. That is the fundamental cause of the systematic difficulty to connect local demands and the values of local populations with the language and the targets of the centralised regulatory agencies. Even with a large proportion of the freshwater available in the planet, the water sector in Latin America merely reproduced the pulses of investment and reorganisation imposed by the leading economies. Such reforms are not happening in a vacuum, but intimately related to the patterns of economic production and consumption promoted by economic globalisation. For those than can pay, the globalised economy can provide wasteful lifestyles, which increasingly depend on large volumes of water and electricity. For the poorer strata of the society, however, globalisation has brought new threats to their livelihood and additional pressures over shared natural resources (Newell, 2007). The consequence is that the ongoing water reforms continue to stir conflicts and provoke bitter reactions among poorer citizens and environmentalists across the region (Liverman and Vilas, 2006).

By and large, contemporary water policies have been contained by their technocratic insistence in the internalisation of costs and the optimisation of resources, while social justice and collective responsibilities for the degradation of shared water resources are left out of the agenda. The priority of economic rationality for the solution of water problems only perpetuates a system of environmental exploitation and social exclusion related to water management that historically characterised water

¹¹ In Brazil, water user charges are normally calculated according to three main factors: volume extracted, rate of use and quality of the returned flow.

management in the country. It has been mentioned elsewhere that market solutions are inadequate to deal with stochastic and complex ecological systems, because it creates a ‘policy lock-in’ that precludes dynamic adjustments (Bromley, 2007). In other words, the priority given to the economic dimension of water management is nothing else than the mainstream political paradigm reflecting its view of itself. As Bowels (2004) observes, market forces have more than only an allocative role, but also exert a disciplinary function that in reality operates through the asymmetric use of power. At the same time, while acknowledging the harmful impacts of market pressures, it is also important to avoid explaining all problems of the new water regime in Brazil as solely the result of broader economic priorities. On the contrary, there are other fundamental factors that locally contribute to management failures. As observed by Prudham (2004), only the juxtaposition of the hegemonic character of market society with the specific political ecological contradictions can “reveal the crisis tendencies of environmental neoliberalism”. It is exactly this powerful articulation between the hegemony of market-based regulation and local power asymmetries that have ultimately responded for the insufficient results of the water reforms in Brazil.

4.1. The way forward?

The new water regulatory regime introduced in the 1990s in Brazil attempted, but failed to bring straightforward responses to multilayered water questions. The fundamental shortcoming of new approaches is the ideological separation between environmental degradation and social inequalities. Because of this fundamental dichotomy, the policies derived from the new water legislation have neglected the social and political context where decisions are made and projects implemented. It has overlooked the crucial fact that water problems in Brazil are closely related to rural land tenure, uneven urban development and socioeconomic opportunities, issues that are mostly excluded from the scope of the water reforms. Policy instruments of the new regime, which include water charges and flexible water regulation, were superimposed to a political system based on discriminatory practices on the national and local scales. Almost all the changes are restricted to the top-level of policy-making, with very limited repercussions on the local problems of water use and conservation. Some improvements in terms of public participation and environmental restoration represent no commitment by politicians or public agencies, but are convenient mechanisms for minimising public opposition against the implementation of the new regulatory regime. Public mobilisation in catchment committees has been systematically neutralised by disputes involving water charges, while economic pressures continued to degrade watercourses and displace local communities. Only the more organised social

groups have been able to understand the intricacies of the new system and have cleverly used their position to maintain and expand privileges.

The overall conclusion is that alternatives to the current management of water reforms require, first and foremost, denouncing the rationality of neoclassical economics and its commanding influence over public water policies. It means that water management problems can only be resolved by bringing together the local (catchment) demands and a national and international resistance to expansion of a market-based society. Alternatives to the ecological crisis can only emerge from the linking of all anti-systemic social movements against the endless accumulation of capital (as described, for example, by Wallerstein, 2003). In other words, improvements in the water sector make no sense without relating it to the totality of the globalised economy and, therefore, the construction of new basis for the relation between nature and society. In strategic terms, critical groups should be able to make use of all opportunities of political resistance, which necessarily includes the official channels currently available in the environmental regulatory system, as a first step in the construction of a genuine agenda of reforms. Even if the social movements cannot immediately keep nature out of the hegemony of neoliberal policies, grassroots mobilisation can advance a robust critique of the unfair and unsustainable appropriation of ecological resources, water in particular. As rightly observed by Heller (2001), sustained and engaged state-society negotiations are the best alternative to allow for continuous institutional learning, to promote innovative solutions and to bridge the knowledge and authority gap between technological expertise and local stakeholder involvement.

References

- Abers, R. N., and M. E. Keck. 2006. Muddy waters: The political construction of deliberative river basingovernance in Brazil. *International Journal of Urban and Regional Research* 30(3): 601-622.
- Agyeman, J., and B. Evans. 2004. 'Just sustainability': The emerging discourse of environmental justice in Britain? *The Geographical Journal* 170(2): 155-164.
- Alves, A. C. 2008. Saneamento básico: A obscuridade jurídica e suas razões. *Sanear* 3: 12-20.
- Anuatti-Neto, F., Barossi-Filho, M., Carvalho, A., and R. Macedo. 2003. *Costs and benefits of privatization: Evidence from Brazil*. Washington, D.C.: IADB.
- Bishop, R. C. 1978. Endangered species and uncertainty: The economics of a safe minimum standard. *American Journal of Agricultural Economics* 60: 10-18.
- Bowles, S. 2004. *Microeconomics: Behavior, institutions and evolution*. New York: Russell Sage Foundation.

- Britto, A., and Silva, R. T. 2006. Water management in the cities of Brazil: Conflicts and new opportunities in regulation. In *Urban water conflicts: An analysis of the origins and nature of water-related unrest and conflicts in the urban context*, pp. 39-51, Paris: IHP/UNESCO.
- Bromley, D. W. 1991. *Environment and economy: Property rights and public policy*. Oxford and Cambridge, Mass.: Blackwell.
- Bromley, D. W. 2007. Environmental regulations and the problem of sustainability: Moving beyond 'market failure'. *Ecological Economics* 63: 676-683.
- Bryant, R. L. 1998. Power, knowledge and political ecology in the Third World: A review. *Progress in Physical Geography* 22: 79-94.
- Burkett, P. 2003. Natural capital, ecological economics, and Marxism. *International Paper in Political Economy*, Vol. 10, No. 3. University of Leeds.
- Burkett, P., and J. B. Foster. 2006. Metabolism, energy, and entropy in Marx's critique of political economy: Beyond the Podolinsky myth. *Theory and Society* 35: 109-156.
- Castle, E. N. 1999. Natural resources and environmental economics: A retrospective view. *Review of Agricultural Economics* 21(2): 288-304.
- Castro, J.E. 2008. Neoliberal water and sanitation policies as a failed development strategy: Lessons from developing countries. *Progress in Development Studies* 8: 63-83.
- Ciriacy-Wantrup, S. V. 1952. *Resource conservation: Economics and policies*. Berkley: University of California Press.
- Coase, R. H. 1960. The problem of social cost. *Journal of Law and Economics* 3: 1-44.
- Conca, K. 2006. *Governing water: Contentious transnational politics and global institutional building*. Cambridge, Mass., and London: MIT Press.
- Coppetec. 2006. *Plano de recursos hídricos da bacia do Rio Paraíba do Sul*. Resende: AGEVAP.
- Daly, H. E., and J. Farley. 2004. *Ecological economics: Principles and applications*. Washington D.C.: Island Press.
- Ditwilier, C. D. 1975. Water problems and property rights: An economic perspective. *Natural Resources Journal* 15: 663-680.
- Faoro, R. 2001. *Os donos do poder: Formação histórica do patronato político brasileiro*. 2nd edition. São Paulo: Globo.
- Fearnside, P. M. 1997. Environmental services as a strategy for sustainable development in rural Amazonia. *Ecological Economics* 20(1): 53-70.

- Féres, J., Thomas, A., Reynaud, A., and R. Serôa da Motta. 2005. *Demanda por água e custo de controle da poluição hídrica nas indústrias da bacia do Rio Paraíba do Sul*. Document No. 1084. IPEA: Rio de Janeiro.
- Formiga-Johnsson, R. M., Kumler, L., and M. C. Lemos. 2007. The politics of bulk water pricing in Brazil: Lessons from the Paraíba do Sul Basin. *Water Policy* 9: 87-104.
- Garrido, R. J. 2004. Reflexões sobre a aplicação da cobrança pelo uso da água no Brasil. In *Gestão de águas doces*, ed. C. J. S. Machado, pp. 105-133, Rio de Janeiro: Interciência.
- GEO Brasil. 2007. *Recursos hídricos*. Brasília: MMA, ANA & PNUMA.
- Gowdy, J., and J. D. Erickson. 2005. The approach of ecological economics. *Cambridge Journal of Economics* 29: 207-222.
- Hall, D., and E. Lobina. 2006. Agua, privatización y ciudadanía. In *La gota de la vida: Hacia una gestión sustentable y democrática del agua*, pp. 288-309, Central America, México & Cuba: Fundación Heinrich Böll.
- Hall, D., and E. Lobina. 2007. Profitability and the poor: Corporate strategies, innovation and sustainability. *Geoforum* 38: 772-785.
- He, J., Chen, X., Shi, Y., and A. Li. 2007. Dynamic computable general equilibrium model and sensitivity analysis for shadow price of water resource in China. *Water Resources Management* 21: 1517-1533.
- Heinz, I., Pulido-Velazquez, M., Lund, J. R., and J. Andreu. 2007. Hydro-economic modeling in river basin management: Implications and applications for the European Water Framework Directive. *Water Resources Management* 21: 1103-1125.
- Heller, P. 2001. Moving the state: The politics of democratic decentralization in Kerala, South Africa, and Porto Alegre. *Politics & Society* 29: 131-163.
- Holland, A-C. S. 2005. *The water business: Corporation versus people*. London and New York: Zed Books.
- Hodgson, G. M. 2006. What are institutions? *Journal of Economic Issues* 40(1): 1-25.
- IBGE. 2004. *Atlas de saneamento*. Rio de Janeiro: IBGE.
- Ioris A. A. R. 2007. The headwaters of water problems in Brazil: Commodification and exclusion. *Capitalism Nature Socialism* 18(1): 28-50.
- Kerr, J., Milne, G., Chhotray, V., Baumann, P., and A.J. James. 2007. Managing watershed externalities in India: Theory and practice. *Environment Development and Sustainability* 9: 263-281.

- Kosoy, N., Martinez-Tuna, M., Muradian, R., and J. Martinez-Alier. 2007. Payments for environmental services in watersheds: Insights from a comparative study of three cases in Central America. *Ecological Economics* 61: 446-455.
- Leff, E. 1996. Marxism and the environmental question: From the critical theory of production to an environmental rationality for sustainable development. In *The Greening of Marxism*, T. Benton, pp. 137-156, New York: The Guilford Press.
- Lemos, M.C., and A. Agrawal. 2006. Environmental governance. *Annual Review of Environment and Resources* 31: 297-325.
- Liodakis, G. 2000. Environmental implications of international trade and uneven development: Toward a critique of environmental economics. *Review of Radical Political Economics* 32(1): 40-79.
- Liverman, D., and S. Vilas. 2006. Neoliberalism and the environment in Latin America. *Annual Review of Environment and Resources* 31: 327-363.
- Machado, C. J. S. 2006. O mundo da administração pública das águas do Estado do Rio de Janeiro segundo o olhar de um antropólogo. *Horizontes Antropológicos* 25: 171-190.
- MARE. 1995. *Plano diretor da reforma do Estado*. Brasília: MARE.
- Marshall, A. 1966 [1890]. *Principles of economics*. 8th edition. London: Macmillan.
- Martinez-Alier, J. 2002. *Environmentalism of the poor: A study of ecological conflicts and valuation*. Cheltenham and Northampton: Edward Elgar.
- May, P. H. 1999. O setor financeiro privado internacional e o meio ambiente: O caso do Brasil. In *Meio ambiente, desenvolvimento sustentável e políticas públicas*, ed. C. Cavalcanti, pp. 299-313. 2nd edition. São Paulo: Cortez.
- Mello, M., 2001. *Privatização do setor de saneamento no Brasil: Quatro experiências e muitas lições*. Document No. 447. Rio de Janeiro: Economics Department, PUC.
- Middleton, N., and P. O'Keefe. 2001. *Redefining sustainable development*. Pluto Press: London.
- Mill, J. S. 1965 [1871]. *Principles of political economy*. 7th edition. Collected works of John Stuart Mill. Toronto: Routledge & Kegan Paul.
- Mitchell, B. 2005. Integrated water resources management, institutional arrangements, and land-use planning. *Environment and Planning A* 37: 1335-1352.
- MMA. 2006. *Plano nacional de recursos hídricos*. Brasília: Ministry of the Environment.
- Mollo, M. L. R., and A. Saad-Filho. 2006. Neoliberal economic policies in Brazil (1994-2005): Cardoso, Lula and the need for a democratic alternative. *New Political Economy* 11(1): 99-123.

- Mulreany, J. P., Calikoglu, S., Ruiz, S., and J. W. Sapsin. 2006. Water privatization and public health in Latin America. *Revista Panamericana de Salud Publica* 19(1): 23–32.
- Newell, P. 2007. Trade and environmental justice in Latin America. *New Political Economy* 12(2): 237-259.
- Oliveira Filho, A. 2006. Institucionalização e desafios da política nacional de saneamento: Um balanço. *Proposta* 110: 12-23.
- Paavola, J. 2007. Institutions and environmental governance: A reconceptualization. *Ecological Economics* 63: 93-103.
- Page, B. 2005. Paying for water and the geography of commodities. *Trans. Inst. British Geographers* 30: 293-306.
- Pigou, A. C. 1938 [1920]. *The economics of welfare*. 4th edition. London: Macmillan.
- Prudham, S. 2004. Poisoning the well: Neoliberalism and the contamination of municipal water in Walkerton, Ontario. *Geoforum* 35: 343–359.
- Ribeiro, E. M., Galizoni, F. M., Calixto, J. S., Assis, T. P., Ayres, E. B., and L. H. Silvestre. 2005. Gestão, uso e conservação de recursos naturais em comunidades rurais do Alto Jequetinhonha. *Estudos Urbanos e Regionais* 7(2): 77-99.
- Ricardo, D. 1962 [1817]. *On the principles of political economy and taxation*. The Works and Correspondence of David Ricardo. London: Cambridge University Press.
- Robertson, M. 2007. Discovering price in all the wrong places: The work of commodity definition and price under neoliberal environmental policy. *Antipode* 39(3): 500-526.
- Rogers, P., Silva, R., and R. Bhatia. 2002. Water is an economic good: How to use prices to promote equity, efficiency, and sustainability. *Water Policy* 4: 1-17.
- Saleth, R. M., and A. Dinar. 2005. Water institutional reforms: Theory and practice. *Water Policy* 7: 1-19.
- Seidl, A., and A. S. Moraes. 2000. Global valuation of ecosystem services: Application to the Pantanal da Nhecolândia, Brazil. *Ecological Economics* 33: 1-6.
- Serôa da Motta, R. 1998. *Manual para valoração econômica de recursos ambientais*. Brasília: MMA.
- Sneddon, C. 2007. Nature's materiality and the circuitous paths of accumulation: Dispossession of freshwater fisheries in Cambodia. *Antipode* 39(1): 167–193.
- Silvano, R. A. M., Udvardy, S., Ceroni, M., and J. Farley. 2005. An ecological integrity assessment of a Brazilian Atlantic Forest watershed based on surveys of stream health and local farmers' perceptions: Implications for management. *Ecological Economics* 53: 369-385.
- Smith, N. 2007. Nature as accumulation strategy. In *Socialist register: Coming to terms with nature*. ed. L. Panitch and C. Leys, pp. 16-36, London: Merlin Press.

- Söderbaum, P. 2000. *Ecological economics*. London: Earthscan.
- Solanes, M., and A. Jouravlev. 2006. *Water governance for development and sustainability*. Serie Recursos Naturales e Infraestructura, Document No. 111. Santiago, Chile: CEPAL.
- Spash, C. L. 1999. The development of environmental thinking in economics. *Environmental Values* 8: 413-435.
- Swaney, J. A. 1987. Elements of a neoinstitutional environmental economics. *Journal of Economic Issues* 21(4): 1739-1779.
- Swyngedouw, E. 2004. *Social power and the urbanization of water: Flows of power*. Oxford Geographical and Environmental Studies. Oxford: Oxford University Press.
- Swyngedouw, E. 2005. Dispossessioning H₂O: The contested terrain of water privatization. *Capitalism Nature Socialism* 16(1): 81-98.
- The World Bank. 1993. *Water resources management: A World Bank policy paper*. Washington, D.C.: IBRD.
- Tolmasquim, M. T., Serôa da Motta, R., La Rovere, E. L., Barata, M. M. L., and A. G. Monteiro. 2001. Environmental valuation for long-term strategic planning: The case of the Brazilian power sector. *Ecological Economics* 37: 39-51.
- UNEP. 2004. *The use of economic instruments in environmental policy: Opportunities and challenges*. Geneva: UNEP.
- Valêncio, N. F. L. S., and R. C. Martins. 2004. Novas institucionalidades na gestão de águas e poder local: Os limites territoriais da democracia decisória. *Interações*: 5(8): 55 – 70.
- Van Houtven, G., Powers, J., and S. K. Pattanayak. 2007. Valuing water quality improvements in the United States using meta-analysis: Is the glass half-full or half-empty for national policy analysis? *Resource and Energy Economics* 29: 206–228.
- Vosti, S. A., Braz, E. M., Carpentier, C. L., d'Oliveira, M. V. N., and J. Witcover. 2003. Rights to forest products, deforestation and smallholder income: Evidence from the western Brazilian Amazon. *World Development* 31(11): 1889-1901.
- WAAP. 2006. *The second UN world water development report: 'Water, a shared responsibility'*. World Water Assessment Programme. Paris: UNESCO & New York: Berghahn Books.
- Wallerstein, I. 2003. The ecology and the economy: What is rational? In *World System History and Global Environmental Change*, Conference Keynote, Lund, Sweden, 19-22 September 2003.
- Ward, F. A. 2007. Decision support for water policy: A review of economic concepts and tools. *Water Policy* 9: 1-31.

Wunder, S. 2007. The efficiency of payments for environmental services in tropical conservation.
Conservation Biology 21(1): 48–58.

Young, C. E. F. 2005. Instrumentos econômicos para o desenvolvimento sustentável: O caso brasileiro. In *As Instituições Financeiras Públicas e o Meio Ambiente no Brasil e na América Latina*, C. Parreira and H. Alimonda, pp. 219-248, Brasília: FLACSO.